In the specification

Please amend the following paragraphs

(Page ~~6~~ 5, first paragraph,)

A2

Fig. 1 shows an overall mechanical schematic of the preferred embodiment. Drum 10 has a latent electrostatic image 13 on its surface 11. It is charged by sensitizing corona 12. If it is a photo sensitive surface it is exposed in an image wise fashion by LED/ strip lens assembly 14. Alternately it could compose an electrostatic printing plate as disclosed by Reisenfeld of US No. 4,732,831 where the image areas retain charge and the background areas discharge before the drum 10 rotates to the developer unit 16. The unit 16 is comprised of toner developer roller 18 that ~~are~~ **is** splashed with liquid toner by pipe 20. The~~y~~ **developer roller 18** rotate**s** in such a manner as to move in the same direction of the drum but typically at a relative velocity of 1.5 times. Reverse roller 22 rotates in a manner opposite the drum 10 and with a relative velocity of 3 times. The purpose of this reverse roller 22 is to scavenge excess toner liquid off the image surface 11 which also controls unwanted background. A corona unit 24 at roughly the 5 o'clock position serves to "compact" the toner image before transfer. This is also referred to as "depress" corona.

(Page ~~7~~ 6, first, second, and third paragraphs,)

A3, cont'd

Cleaning unit 36 typically consists of a squeegee roller 38 that does bulk, rough removal of residual toner, while wiper blade 40 does the final, complete cleaning of the drum surface 11. The drum 10 is now ready for the next image. **Excess liquid 51 can be removed by any means, e.g., blown dry with air 27.**

Important details of this embodiment are revealed by Fig. 2. Here is shown an enlarged view of the drum 10, gap 42, glass structure 26 at the transfer point, nominally at 6 o'clock. The drum 10 is wet with liquid toner **50** and residual diluent **51** coming into the nip formed by drum 10 and glass 26. The glass is pre-wetted with clear diluent to ensure that the gap between drum and glass is filled with liquid. Metering of liquid on the drum and the pre-wetting liquid on the glass is not very precise so a wave of excessive liquid 44 builds up in the input to the nip. This is referred to, herein, as the Tsunami effect. The toner on the drum before transfer 50 needs to transfer to the glass in a location of low turbulence, about 6 o'clock.

A3 end

Alternately on the output end, the amount of liquid between drum and glass is precisely determined by the gap which is between 50μ to 150μ and can be easily controlled to +/- 5μ with the "floating" techniques mentioned previously. Therefore a "film splitting" occurred as shown in Figure 2 not necessarily 50%/50% as suggested by this drawing. Actual values will depend on the surface energy of the drum surface (amorphous selenium or silicon or alternately a photopolymer) versus that of the glass. For the purposes of this invention the film splitting point 46 is precisely defined and unchanging for particular materials and one gap setting while the wave front **of excessive liquid** 44 is highly unstable and moves to the right from the beginning of the glass sheet to its end and can become quite violent and turbulent.

(Page ~~8~~ 7, second full paragraph,)

A4

Third: After transfer toner particles 48 are tightly bound to the surface of the glass by the internal transfer charges from the transfer corona **30**. This prevents them from being smeared by random motion of residual diluent liquids on the glass before the toner is dried. Alternately if toner is transferred to a metal surface it is held to that surface by its "image" charge "seen" in the metal. This is classical electrostatic theory. Typically these "image" forces are significantly smaller than the strong binding forces between surface toner and the nearby transfer charges.

(Page ~~8~~ 7, last paragraph ~~-page 9,~~)

A5

The electrostatic printing plate is shown in Fig. 3a is a photopolymer layer 52 bonded to an electrically grounded substrate 54. A photopolymer layer ~~54~~ **52** is heat and pressure laminated to a grounded substrate, typically an aluminized polyester film (PET). It is then exposed through a contact photo tool to actinic radiation **60** (350nm to 440nm wavelength) to cross link the exposed areas **53**. In Fig. 3b the plate is charged by a corona unit 56. The cross linked areas are much higher in electrical resistivity than normal photopolymer so they store charge for significant periods of time. After a suitable delay to allow the normal photopolymer to discharge **55**, we have a latent image **62**on the printing plate as in Fig. 3c. In Fig. 3d a "reversal" development is effected with a liquid toner 58, i.e. development of the discharged areas of the plate (those referred to as normal photopolymer or not cross linked). Note the process can be a "normal" image, where the charged areas are developed or reversed as previously mentioned.

(Page ~~10~~ 8, first full paragraph,)

A6

An important feature of this invention is the partial exposure of the photo resist. Data has shown that the photopolymer 52 is exposed in ever increasing thickness of a layer 57 starting at its surface, as shown in Fig. 4a through 4c. Increasingly by longer exposure to actinic radiation 60 cross-links ever deeper layer of the photo polymer. Therefore if one is using photopolymer at 38 micron thick but wants to make 5μ features, one might expose only one quarter **57a** of it in thickness 57 as shown in Fig. 4b. One now has highly resistive image in a "sea" of less resistive background areas. Since we never remove the unexposed background areas (an indeed their presence is a critical element in the success of the process, as discussed next), the partially exposed (or unexposed layers under the image) present no problems. One determines the proper level of exposure for the "partial exposure" condition by a series of increasing exposure levels and measuring the charge voltage in large solid areas.

(Page ~~13~~ 11, first full paragraph,)

A7

An earlier version of the "pinched" design was the scorotron at the bottom of Fig. 6d. Here a metallic grid 76 structure in front of the corona wire is biased to a voltage ~~**perhaps 10% to 25%**~~ above the desired surface voltage (typically +800 for a 60μ thick amorphous selenium layer).

(Page ~~13~~ 11, third paragraph,)

A8 cont'd

One problem with the simple corona unit is that in the negative mode the corona discharge is not positionally stable but moves back and forth randomly. One "fix" for this is to super-impress on the DC voltage to the corona wire, typically a ripple value of 10% to 20% of the DC. This caused the high intensity nodes of negative corona discharge to move down the wire at the AC frequency (usually 50 or 60 Hz). This simple, low cost solution was adequate for low speed copiers or printers, but when higher speed units were being designed, a new corona structure, the dicorotron **78** ~~**18**~~ was invented, see Fig. 6c. This used a glass coated wire 77 which was driven by an ac voltage. The shroud (or shield) was biased to a DC voltage which

A8 cont

would define whether positive or negative charge was extracted by the corona unit. This design has the advantages of a large diameter glass coated wires that was not easily "fouled" with random dust or toner particles. The bias power supply for the shield was also a low cost design. One unfortunate aspect of this design was that the dicorotron corona unit produced considerable levels of ozone. This trace gas is becoming unacceptable in the office environment.

(Page ~~18~~ 13, fifth paragraph,)

A9

Printing plate 400 consists of a photopolymer 402 of 10 to 50 micron thickness connected to electrical ground. Receiving glass plate 404 of typical thickness 0.5 to 3.0 mm thickness is backed by a field electrode 406 connected to transfer voltage 408. It is separated by mechanical gap ~~**430**~~ **410** from printing plate 400. The equivalent circuit for this structure 412 is shown to the right.

(Page ~~16~~ 13, first full paragraph,)

A10

Now applying electromagnetic theory to the glass 404/ gap ~~**430**~~ **410** structure initially when a step function of voltage is applied the voltages divide capacities between the elements, glass, gap, and plate. Since the imaged areas of the plate 400 are highly resistive they can be disregarded for short periods of time. Since the glass is thicker than the gap, typically 10 to 100 times, and it's dielectric constant is 5 verses 2.1 of the liquids in the gap, the voltages divided preferentially across the glass with little across the gap. If the conductivity of the gap fluids is higher than the glass this situation will worsen the time and transfer will be inhibited.

(Page ~~17~~ 14, first full paragraph,)

A11 cont'd

Printing plates 430 and 432 in Figs. 10a and b respectively are "negative" images of each other. 430 is cross linked in the image area and developed with toner 434. 432 is cross - linked in the non-image areas and developed with toner 434. Both plates are sensitized with charges 433. Field plates 436 ~~**and**~~ **are** driven by voltages 438 and 440 respectively. Receiving glass 442

A11 end

accepts the transferred image. Mechanical gap 444 is filled with transfer fluid (not shown). High resistivity regions 446 are the cross - linked regions of the plate. Induced charges 448 occur when the transfer voltage is applied and are restricted to the non-cross linked regions of the plate.

(Page ~~20~~ 16, first paragraph,)

A12

Fig. 11 shows this embodiment. Chuck 100 carrying electrostatic printing plate 102 is transported on linear bearings 104 by belt drive 106, canted at roughly a 45° angle to the horizontal. At the beginning of the print cycle chuck 100 starts at the top near pulley 108. Moving at uniform speed it passes corona unit 110 which charges the printing plate, 102 with a uniform electrostatic charge. After a short period of time, the low resistivity areas of the plate **~~with~~** **will** discharge to a negligible charge level; the high resistivity areas of the plate retain the charge to near original levels.

(Page ~~20~~ 17, last paragraph – page 21,)

A13

Chuck 100 with printing plate 102 is now lifted vertically by means not shown or simply rotated clockwise by approximately 135° to its original position. Receiving substrate 130 is now dried before removing it from its chuck 132. Plate 102 is now moved up the 45° ramp and cleaned by suitable means, not shown, to repeat the next printing step. **The timing and movements of the process and components can be synchronized by an electronic controller 150.**

(Page ~~21~~ 18, second paragraph,)

A14 Cont'd

Fig. 12 shows a cross section of the cathode plate 200 of an AC Plasma Color Display Panel. It consists of a glass back plate **~~200~~** **201** with black glass spacer ribs 202 that optically and electrically isolated image cells **210** from one another. These ribs are typically 100μ high and 30μ to 40μ in nominal width. At the bottom of the "wells" are the address electrode lines of copper 204 or nickel metal. Covering the walls and bottom of the "canyons" is the phosphor 206

A14 end

that converts the UV radiation from the plasma discharge to visible radiation, RG&B in the case of a color display. Alternate canyons are coated with red, then green then blue phosphor.

(Page ~~22~~ 18, first paragraph,)

A15

Fig. 13**A** is a greatly magnified picture of the mechanical gap 220 between the print drum **10** and glass surface **201** ~~**200**~~ of the invention. The gap here is set to a value of 150μ. In the first manufacturing step glass toner is printed to make the spacer/isolator ribs 202. Four layers of toner 203 is shown, each about 25μ high, one printed on top of the other. The manufacturing sequence is as follows:

(Page ~~22~~ 19, last paragraph,)

A16

Figure 13**B** shows the process for the printing of the metallic address electrodes 204 in the base of the canyons formed by the ribs. A palladium catalytic toner 224 is image**d** on the drum and transferred across the 150μ gap **220** to the base of the canyons **210**. The toner is dried leaving a very thin layer of palladium seeds **214** in a line that runs the length of the canyons. The plate is removed from the printing machine of the invention and immersed in an "electroless" plating bath. Metal grows from solution is on the palladium seeds, then on previously plated metal. Electroless processes have advanced to a point where one can plate up to one micron of metal per minute. After the growth of about 25μ of metal 226, usually nickel, the cathode electrodes are complete.

(Page ~~23~~ 19, first paragraph,)

A17, cont'd

Figure 13**C** shows the deposition of phosphor toner 230 in the canyons. Phosphor toner 230 is imaged on the plate **10** and transferred across the 150μ gap **220**. Generally the transferred toner moves in straight lines but can coat relief images like coins. The toner image is sized to cover the walls of the canyons as well as the base where the electrodes are located. Note one phosphor color is imaged at a time so the printing plate has an image of every third canyon on it. After the first phosphor color 230 is imaged the toner is dried with warm air to set it; then the

A17 end

second color is imaged; then the third color. The same printing plate can be used for all three colors; all that is needed is to mechanically index the glass with respect to the printing drum.

(Page ~~24~~ 20, second paragraph,)

A18

In this case the coated glass 300 is imaged with the RGB color mosaics 304 which are then reflowed by final heating. The plate is now complete except for the black intermatrix which has yet to be produced. Transparent conductive layer **301** is electrically grounded through edge contact 306 as shown in Fig. 14a. Now the entire plate is corona charged with a suitable corona generator 308 as in Fig. 14a. The conductive under layer discharges immediately, while the color mosaics retain their charge 310 for considerable periods of time, as much as thousands of a second depending on the resins used in the mosaics. The partially finished color filter plate is now its own electrostatic printing plate, as seen in Fig. 14b. It can be developed in the reversal mode (i.e. develop the discharged [or uncharged] areas of the image) as is done in virtually all desk top laser printers.

(Page ~~24~~ 20, last paragraph – ~~page 25,~~)

A19

In the example shown, the mosaics are charged positively so a toner with a positive charge 312 will develop the non-charged areas as in Fig. 14c. This black toner **312** will produce the intermatrix between the mosaics. After the toner is dried, it may be reflowed by heating if necessary, but there are good reasons to leave it a particulate layer which will hold the unfused toner in place.

(Page ~~24~~ 21, second full paragraph,)

A20 cont'd

Another "self-printing" example as shown in this embodiment is seen in Fig. 14d. This glass plate #330 is typical of the face plate of a field emission display (FED). The glass is first coated with black chrome oxide #332 to enhance optical contrast and with a metallic chrome layer #334 to conduct away to ground the electrons that hit the phosphor. It is desired to coat phosphor in the bare spaces on the glass surface between the chrome fingers 332 which are all connected together. To "self-print" the phosphor toner the glass panel is placed on an

A20 end

electrically ground plate #336, chrome side up. Using a wire or metallic probe #338 the chrome layer is made to act as an electrode by connecting it to a high voltage power supply, as high as possible before electrical breakdown occurs. Liquid toner is now poured over the plate and it is noted that toner #340 "develops" on the bare glass areas by means of the fringing electrical fields. If the toner particles have a positive charge on them, a positive voltage must be connected to the chrome layer; with negative toner conversely a negative voltage with respect to ground is needed. As before open area defects in the chrome layer will have toner deposited on them in a "self-healing" manner.